

Sequence Listing

5 <110> Degussa AG
10 <120> Novel alcohol dehydrogenases
15 <130> S-IPM-PAT/Dr. Re-kö - K1419 EP
20 <160> 68
25 <170> PatentIn version 3.1
30 <210> 1
35 <211> 162
40 <212> PRT
45 <213> unknown
50 <220>
55 <221> source
60 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
65 ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
70 ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylomonas;
75 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus; ZF0050544= Phyllobacterium rubiacearum; ZF0002852= Rhodococcus; ZF0050310= Arthrobacter paraffineus; ZF0002862= Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces; ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765= Streptomyces; ZF0051305= Bacterium; ZF0003513= Actinomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0002332= Streptomyces diastatochromogenes; ZF0003768= Actinomyces; ZF0002379= Streptomyces coelescens; ZF0002351= Nonomuraea roseoviolacea; ZF0003769= Actinomyces;
65 <400> 1
70 Gly Pro Trp Gly Cys Gly Asn Cys Trp His Cys Ser Gln Gly Leu Glu
75 1 5 10 15
80 Asn Tyr Cys Ser Arg Ala Gln Glu Leu Gly Ile Asn Pro Pro Gly Leu
85 20 25 30
90 Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg
95 35 40 45
100 His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu
105 50 55 60

Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro
65 70 75 80

5

Lys Leu Arg Gly Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

10

Gly His Val Ala Ile Gln Leu Leu Arg His Leu Ser Ala Ser Thr Val
100 105 110

15 Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Glu Leu Ala Thr Lys Val
115 120 125

20 Gly Ala His Glu Val Val Leu Ser Asp Lys Asp Ala Ala Glu Asn Val
130 135 140

25 Arg Lys Ile Thr Gly Ser Gln Gly Ala Ala Leu Val Leu Asp Phe Val
145 150 155 160

Gly Tyr

30 <210> 2

<211> 128

35 <212> PRT

<213> unknown

<220>

40 <221> source

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337=

45 Methylomonas; ZF0051321= Bacterium; ZF0050782= Lactobacillus
bulgaricus; ZF0050544= Phyllobacterium rubiacearum; ZF0002852=
Rhodococcus; ZF0050310= Arthrobacter paraffineus; ZF0002862=

50 Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0002031=

Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=

Streptomyces; ZF0002437= Streptomyces; ZF0003712=

55 Micromonospora; ZF0003765= Streptomyces; ZF0051305= Bacterium;
ZF0003513= Actinomyces; ZF0050993= Kocuria; ZF0002018=

Streptomyces; ZF0003767= Actinomyces; ZF0002332= Streptomyces
diastatochromogenes; ZF0003768= Actinomyces; ZF0002379=

Streptomyces coelescens; ZF0002351= Nomonuraea roseoviolacea;
ZF0003769= Actinomyces;

<400> 2

Gly Pro Trp Gly Cys Gly Asn Cys Trp His Cys Ser Gln Gly Leu Glu
1 5 10 15

5 Asn Tyr Cys Ser Arg Ala Gln Glu Leu Gly Ile Asn Pro Pro Gly Leu
20 25 30

10 Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg
35 40 45

15 His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu
50 55 60

20 Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro
65 70 75 80

Lys Leu Arg Gly Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

25 Gly His Val Thr Ile Gln Leu Leu Arg His Leu Ser Ala Ala Thr Val
100 105 110

30 Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Glu Leu Ala Thr Lys Val
115 120 125

<210> 3

35 <211> 162

<212> PRT

40 <213> unknown

<220>

<221> source

45 <223> ZF0050286= Corynebacterium hoagii

<400> 3

50 Gly Pro Trp Gly Cys Gly Arg Cys Trp His Cys Ala Gln Gly Leu Glu
1 5 10 15

Asn Tyr Cys Ser Arg Ala Arg Glu Leu Gly Ile Ala Pro Pro Gly Leu
20 25 30

55 Gly Ala Pro Gly Ala Ile Ala Glu Tyr Met Ile Val Asp Ser Pro Arg
35 40 45

His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Thr Thr Val Pro Leu
50 55 60

5 Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Gly
65 70 75 80

10 Lys Leu Arg Ala Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

15 Gly His Val Gly Ile Gln Leu Leu Arg His Leu Ser Pro Ala Arg Ile
100 105 110

20 Ile Ala Leu Asp Val Asn Asp Glu Lys Leu Ala Phe Ala Arg Glu Val
115 120 125

Gly Ala His Glu Thr Val Leu Ser Asn Ala Asp Ala Ala Asn Val
130 135 140

25 Arg Lys Ile Thr Gly Ser Ala Gly Ala Ala Leu Val Leu Asp Phe Val
145 150 155 160

30 Gly Tyr

35 <210> 4

<211> 161

<212> PRT

40 <213> unknown

<220>

45 <221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 4

50 Gly Pro Trp Gly Cys Gly Ser Cys Trp His Cys Ser Gln Gly Leu Glu
1 5 10 15

55 Asn Tyr Cys Ser Arg Ala Lys Glu Leu Gly Ile Asn Pro Pro Gly Leu
20 25 30

Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg

35

40

45

	His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu			
5	50	55	60	
	Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro			
	65	70	75	80
10	Lys Leu Arg Gly Gly Ala Tyr Ala Val Val Ile Gly Thr Gly Gly Leu			
	85	90	95	
15	Gly His Val Ala Ile Gln Leu Leu Arg His Leu Ser Ala Ala Thr Val			
	100	105	110	
20	Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Val Leu Ala Thr Lys Val			
	115	120	125	
25	Gly Ala His Glu Val Val Leu Ser Asp Lys Asp Ala Ala Glu Asn Val			
	130	135	140	
30	Gly			
35	<210> 5			
	<211> 70			
	<212> PRT			
40	<213> unknown			
	<220>			
	<221> source			
45	<223> ZF0004210= Actinomyces; ZF0004212= Actinomyces; ZF0004211= Actinomyces; ZF0003860= Actinomyces; ZF0004218= Actinomyces; ZF0003868= Actinomadura; ZF0004213= Actinomyces; ZF0003876= Actinomyces; ZF0003866= Actinomyces; ZF0003864= Actinomyces; ZF0003862= Actinomadura; ZF0003869= Actinomyces; ZF0003867= Actinomyces; ZF0004216= Actinomyces; ZF0004235= Actinomyces; ZF0004209= Actinomadura; ZF0004214= Actinomyces; ZF0003871= Actinomyces; ZF0004063= Actinomadura; ZF0004052= Actinomadura; ZF0006405= Streptomyces; ZF0003865= Actinomadura; ZF0004047= Actinomadura; ZF0004070= Actinomyces; ZF0004085= Actinomyces; ZF0004217= Actinomyces; ZF0004089= Actinomadura; ZF0004090= Actinomadura; ZF0006138= Streptomyces; ZF0004236= Actinomadura; ZF0051203= Bacterium;			
55	<400> 5			

Gly Pro Trp Gly Cys Gly Thr Cys Val Lys Cys Ala Glu Gly Lys Glu
 1 5 10 15

5

Asn Tyr Cys Leu Arg Ala Lys Glu Leu Gly Ile Ala Pro Pro Gly Leu
 20 25 30

10 Gly Ser Pro Gly Ala Met Ala Glu Tyr Met Ile Val Asp Asp Pro Arg
 35 40 45

15 His Leu Val Pro Leu Gly Gly Leu Asp Pro Val Gln Ala Val Pro Leu
 50 55 60

20 Thr Asp Ala Gly Leu Thr
 65 70

20

<210> 6

<211> 94

25

<212> PRT

<213> unknown

30

<220>

<221> source

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;

35

ZF0050544= Phyllobacterium rubiacearum; ZF0002031=

Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=

Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;

ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=

Actinoplanes philippensis; ZF0002441= Streptomyces;

ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=

40

Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=

Micromonospora; ZF0004980= Streptomyces; ZF0004821=

Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=

Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;

ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=

45

Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;

ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=

Actinomyces; ZF0003535= Actinomyces;

50

<400> 6

Cys His Thr Asp His His Ile Val Thr Gly Ala Thr Pro Met Pro Ser
 1 5 10 15

55

Phe Pro Val Met Gly Gly His Glu Gly Ser Gly Val Ile Thr Lys Leu
 20 25 30

Gly Pro Glu Val Lys Gly Leu Glu Val Gly Asp His Val Val Leu Ser

35

40

45

5 Phe Ile Pro Ala Cys Gly Thr Cys Pro Ala Cys Ser Ala Gly His Gln
 50 55 60

10 Asn Leu Cys Asp Leu Gly Met Gly Leu Leu Ser Gly Gln Ala Ile Ser
 65 70 75 80

15 Asp Gly Thr Tyr Arg Ile Gln Ala Arg Gly Glu Asn Val Ile
 85 90

20 <210> 7
 <211> 92
 25 <212> PRT
 <213> unknown
 <220>
 30 <221> source
 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
 ZF0050993= Kocuria; ZF0002018= Streptomyces;
 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331= Actinoplanes philippensis; ZF0002441= Streptomyces;
 ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240= Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713= Micromonospora; ZF0004980= Streptomyces; ZF0004821= Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396= Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces; ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium; ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538= Actinomyces; ZF0003535= Actinomyces;

40 <400> 7
 45 Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
 1 5 10 15

50 Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
 20 25 30

55 Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
 35 40 45

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
 50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
 65 70 75 80
 5

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
 85 90

10 <210> 8

15 <211> 92

20 <212> PRT

25 <213> unknown

30 <220>

35 <221> source
 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
 Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
 Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
 Actinoplanes philippensis; ZF0002441= Streptomyces;
 ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
 Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
 Micromonospora; ZF0004980= Streptomyces; ZF0004821=
 Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
 Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
 ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
 Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
 ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
 Actinomyces; ZF0003535= Actinomyces;

40 <400> 8

Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
 1 5 10 15

45 Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
 20 25 30

50 Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
 35 40 45

55 Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
 50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
 65 70 75 80

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
 85 90

5

<210> 9

<211> 92

10 <212> PRT

<213> unknown

<220>

15

<221> source

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
 ZF0050993= Kocuria; ZF0002018= Streptomyces;
 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331= Actinoplanes philippensis; ZF0002441= Streptomyces;
 ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240= Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713= Micromonospora; ZF0004980= Streptomyces; ZF0004821= Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396= Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces; ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium; ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538= Actinomyces; ZF0003535= Actinomyces;

<400> 9

35

Cys	His	Thr	Asp	Asp	His	Ala	Val	Thr	Gly	Asp	Leu	Ala	Val	Pro	Leu
1					5			10					15		

40

Pro	Val	Ile	Gly	Gly	His	Glu	Gly	Ala	Gly	Ile	Val	Glu	Lys	Val	Gly
			20					25				30			

45

Pro	Gly	Val	Arg	Asp	Val	Glu	Val	Gly	Asp	His	Val	Val	Leu	Ser	Phe
			35			40				45					

50

Ile	Pro	Ser	Cys	Gly	Arg	Cys	Arg	Trp	Cys	Ala	Val	Gly	Gln	Ser	Asn
			50			55			60						

Leu	Cys	Asp	Leu	Gly	Ala	Ile	Leu	Met	Ala	Gly	Ala	Gln	Val	Asp	Gly
65					70			75				80			

55

Thr	Tyr	Arg	Ala	Thr	Ala	Arg	Gly	His	Asp	Val	Gly
					85			90			

<210> 10
<211> 92
5 <212> PRT
<213> unknown

<220>
10 <221> source
<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
15 Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
20 Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
25 Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

<400> 10
30 Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
1 5 10 15

35 Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

40 Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

45 Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60
Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Arg Val Asp Gly
65 70 75 80

50 Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
85 90

55 <210> 11
<211> 92
<212> PRT

<213> unknown

<220>

5

<221> source

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
10 Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
15 Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
20 Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

<400> 11

25

Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
1 5 10 15

30

Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

35

Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

40

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60

45

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
65 70 75 80

50

<210> 12

<211> 93
<212> PRT

55

<213> unknown

<220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 12

5

Cys His Thr Asp Leu Phe Thr Lys Ser Val Leu Pro Glu Arg Leu Gly
1 5 10 1510 Pro Cys Val Phe Gly His Glu Gly Ala Gly Val Val Glu Ala Val Gly
20 25 3015 Ser Ser Ile Asp Ser Ile Ala Pro Gly Asp His Val Leu Leu Ser Tyr
35 40 4520 Arg Ser Cys Gly Val Cys Arg Gln Cys Leu Ser Gly His Arg Ala Tyr
50 55 6025 Cys Glu Ser Ser His Gly Leu Asn Ser Ser Gly Ala Arg Thr Asp Gly
65 70 75 8025 Ser Thr Pro Val Arg Arg Ser Gly Thr Pro Ile Arg Ser
85 90

30 <210> 13

<211> 93

35 <212> PRT

<213> unknown

<220>

40 <221> source
<223> ZF0002333=Rhodoccocus erythropolis

<400> 13

45 Cys His Thr Asp Leu Phe Thr Lys Thr Val Leu Pro Glu Lys Leu Gly
1 5 10 1550 Pro Cys Val Phe Gly His Glu Gly Ala Gly Val Val Gln Ala Val Gly
20 25 3055 Ser Ser Ile Asp Asn Ile Ala Ala Gly Asp His Val Leu Leu Ser Tyr
35 40 45Arg Ser Cys Gly Val Cys Arg Gln Cys Leu Ser Asp His Arg Ala Tyr
50 55 60

Cys Glu Ser Ser His Gly Leu Asn Ser Ser Gly Ala Arg Thr Asp Gly
 65 70 75 80

5 Ser Thr Pro Val Arg Arg Asn Gly Thr Pro Ile Arg Ser
 85 90

10 <210> 14
 <211> 120
 <212> PRT
 15 <213> unknown
 <220>
 20 <221> source
 <223> ZF0051303= Bacterium; ZF0051337= Methylomonas; ZF0002862=
 Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0051305=
 Bacterium; ZF0003513= Actinomyces; ZF0002351= Nomonuraea
 roseoviolacea; ZF0003769= Actinomyces; ZF0002017= Streptomyces;
 25 ZF0051306= Bacterium; ZF0002016= Streptomyces; ZF0003504=
 Actinomyces; ZF0006073= Streptomyces; ZF0003770= Actinomyces;
 ZF0002352= Actinoplanes italicus; ZF0002378= Streptomyces
 aureomonopodiales; ZF0006089= Streptomyces; ZF0006106=
 Streptomyces; ZF0051325= Bacterium; ZF0006108= Streptomyces;
 30 ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532=
 Actinomyces; ZF0003548= Nocardiaform;

<400> 14

35 Cys Gly Thr Asp Arg Glu Ile Ala Ser Gly Ile Tyr Gly Trp Ala Pro
 1 5 10 15

40 Pro Gly Arg Glu His Leu Val Leu Gly His Glu Ser Leu Gly Arg Val
 20 25 30

Arg Thr Ala Pro Asp Gly Ser Gly Phe Ala Ala Gly Asp Leu Val Val
 35 40 45

45 Gly Ile Val Arg Arg Pro Asp Pro Val Pro Cys Gly Ala Cys Ala His
 50 55 60

50 Gly Glu Phe Asp Met Cys Arg Asn Gly Glu Tyr Val Glu Arg Gly Ile
 65 70 75 80

55 Lys Gln Ile Asp Gly Tyr Gly Ser Thr Ser Trp Val Val Asp Ala Asp
 85 90 95

Tyr Thr Val Lys Leu Asp Pro Ala Leu Thr Glu Val Gly Val Leu Met

	100	105	110
5	Glu Pro Thr Thr Val Leu Gly Gln 115 120		
	<210> 15		
	<211> 140		
10	<212> PRT		
	<213> unknown		
	<220>		
15	<221> source		
	<223> ZF0051303= Bacterium; ZF0051337= Methylomonas; ZF0002862=		
	Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0051305=		
	Bacterium; ZF0003513= Actinomyces; ZF0002351= Nomonuraea		
20	roseoviolacea; ZF0003769= Actinomyces; ZF0002017= Streptomyces;		
	ZF0051306= Bacterium; ZF0002016= Streptomyces; ZF0003504=		
	Actinomyces; ZF0006073= Streptomyces; ZF0003770= Actinomyces;		
	ZF0002352= Actinoplanes italicus; ZF0002378= Streptomyces		
	aureomonopodiales; ZF0006089= Streptomyces; ZF0006106=		
25	Streptomyces; ZF0051325= Bacterium; ZF0006108= Streptomyces;		
	ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532=		
	Actinomyces; ZF0003548= Nocardiaform;		
	<400> 15		
30	Cys Gly Thr Asp Leu His Ile Arg Ser Trp Asp Gly Trp Ala Gln Lys 1 5 10 15		
35	Thr Ile Ala Thr Pro Leu Thr Leu Gly His Glu Phe Val Gly Glu Val 20 25 30		
40	Val Glu Thr Gly Arg Asp Val Thr Asp Ile Gln Val Gly Asp Leu Val 35 40 45		
45	Ser Gly Glu Gly His Leu Val Cys Gly Lys Cys Arg Asn Cys Leu Ala 50 55 60		
	Gly Arg Arg His Leu Cys Arg Ala Thr Val Gly Leu Gly Val Gly Arg 65 70 75 80		
50	Asp Gly Ala Phe Ala Glu Tyr Val Val Leu Pro Ala Ser Asn Val Trp 85 90 95		
55	Val His Arg Val Pro Val Asp Leu Asp Val Ala Ala Ile Phe Asp Pro 100 105 110		
	Phe Gly Asn Ala Val His Thr Ala Leu Ser Phe Pro Leu Val Gly Glu		

115

120

125

5 Asp Val Leu Val Thr Gly Ala Gly Thr Ile Gly Ile
 130 135 140
 <210> 16
 <211> 138
 10 <212> PRT
 <213> unknown
 <220>
 15 <221> source
 <223> ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
 ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310=
 Arthrobacter paraffineus; ZF0002437= Streptomyces; ZF0003712=
 20 Micromonospora; ZF0003765= Streptomyces; ZF0002332=
 Streptomyces diatsatochromogenes; ZF0003768= Actinomyces;
 ZF0002379= Streptomyces coelescens; ZF0002443= Streptomyces;
 ZF0002442= Streptomyces; ZF0002436= Streptomyces; ZF0050994=
 Bacterium; ZF0050992= Bacterium; ZF0050442= Bacterium;
 25 ZF0002049= Streptomyces; ZF0006069= Streptomyces; ZF0006075=
 Streptomyces; ZF0004724= Nocardiaform; ZF0002392= Actinoplanes
 nippensis; ZF0002356= Actinoplanes brasiliensis; ZF0003501=
 Actinomyces; ZF0051322= Bacterium; ZF0006078= Streptomyces;
 ZF0006092= Streptomyces; ZF0006090= Streptomyces; ZF0006084=
 30 Streptomyces; ZF0006068= Streptomyces; ZF0050284= Rhodococcus;
 ZF0050028= Agrobacterium tumefaciens; ZF0003540= Actinomyces;
 ZF0003528= Actinomyces; ZF0003529= Actinomyces;
 <400> 16
 35 Gly Leu Thr Ile Gly His Glu Pro Val Gly Val Ile Glu Lys Leu Gly
 1 5 10 15
 40 Ser Ala Val Thr Gly Tyr Arg Glu Gly Gln Arg Val Ile Ala Gly Ala
 20 25 30
 Ile Cys Pro Asn Phe Asn Ser Tyr Ala Ala Gln Asp Gly Ala Pro Ser
 45 35 40 45
 Gln Asp Gly Ser Tyr Leu Val Ala Ser Gly Ala Cys Gly Cys His Gly
 50 55 60
 50
 Tyr Arg Ala Thr Ala Gly Trp Arg Phe Gly Asn Ile Ile Asp Gly Ala
 65 70 75 80
 55 Gln Ala Glu Tyr Leu Leu Val Pro Asp Ala Gln Gly Asn Leu Ala Pro
 85 90 95

Val Pro Asp Asn Leu Ser Asp Glu Gln Val Leu Met Cys Pro Asp Ile
 100 105 110

5

Met Ser Thr Gly Phe Lys Gly Ala Glu Asn Ala His Ile Arg Ile Gly
 115 120 125

10 Asp Thr Val Ala Val Phe Ala Gln Gly Pro
 130 135

15 <210> 17

<211> 144

<212> PRT

20 <213> unknown

<220>

25 <221> source

<223> ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
 ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310= Arthrobacter paraffineus; ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765= Streptomyces; ZF0002332= Streptomyces diatsatochromogenes; ZF0003768= Actinomyces; ZF0002379= Streptomyces coelescens; ZF0002443= Streptomyces; ZF0002442= Streptomyces; ZF0002436= Streptomyces; ZF0050994=Bacterium; ZF0050992= Bacterium; ZF0050442= Bacterium; ZF0002049= Streptomyces; ZF0006069= Streptomyces; ZF0006075= Streptomyces; ZF0004724= Nocardiaform; ZF0002392= Actinoplanes nipponensis; ZF0002356= Actinoplanes brasiliensis; ZF0003501= Actinomyces; ZF0051322= Bacterium; ZF0006078= Streptomyces; ZF0006092= Streptomyces; ZF0006090= Streptomyces; ZF0006084= Streptomyces; ZF0006068= Streptomyces; ZF0050284= Rhodococcus; ZF0050028= Agrobacterium tumefaciens; ZF0003540= Actinomyces; ZF0003528= Actinomyces; ZF0003529= Actinomyces;

40 <400> 17

45 Cys Gly Thr Asp Leu His Ile Leu Gly Gly Asp Val Pro Glu Val Thr
 1 5 10 15

Asp Gly Arg Ile Leu Gly His Glu Ala Val Gly Thr Val Val Glu Val
 20 25 30

50

Gly Asp Gly Val Gln Thr Leu Ala Pro Gly Asp Arg Val Leu Val Ser
 35 40 45

55

Cys Val Thr Ala Cys Gly Thr Cys Arg Phe Cys Arg Glu Ser Arg Tyr
 50 55 60

Gly Gln Cys Leu Gly Gly Gly Trp Ile Leu Gly His Leu Ile Asp
65 70 75 80

5

Gly Thr Gln Ala Glu Leu Val Arg Val Pro Tyr Ala Asp Asn Ser Thr
85 90 95

10 His Arg Ile Pro Asp Gly Val Ser Asp Glu Gln Met Leu Met Leu Ala
100 105 110

15 Asp Ile Leu Pro Thr Ser Tyr Glu Val Gly Val Leu Asn Gly Cys Leu
115 120 125

20 Arg Pro Ala Asp Val Val Ile Ile Gly Ala Asp Asp Arg Pro Leu
130 135 140

<210> 18

<211> 73

25 <212> PRT

<213> unknown

30 <220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

35 <400> 18

Val Asp Val Val Val Asp Asn Ala Gly Phe Gly Thr His Gly Ala Phe
1 5 10 15

40

Val Asp Glu Asp His Glu Arg Val Thr Ser Glu Ile Gln Leu Asn Ile
20 25 30

45 Ala Thr Leu Val Glu Leu Thr His Thr Phe Pro Pro Asp Leu Leu Thr
35 40 45

Gly Arg Gly Ala Leu Val Asn Ile Ala Ser Thr Ala Ser Phe Gln Pro
50 55 60

5 Thr Pro Gly Met Ala Val Tyr Cys Ala
65 70

10 <210> 19

<211> 75

<212> PRT

15 <213> unknown

<220>

20 <221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 19

25 Val Asp Val Val Val His Asn Ala Gly Phe Gly Thr His Gly Ala Phe
1 5 10 15

Val Asp Glu Asp Leu Glu Arg Val Thr Ser Glu Ile Gln Leu Asn Ile
20 25 30

30

Ala Thr Leu Val Glu Leu Thr His Thr Phe Leu Pro Asp Leu Leu Thr
35 40 45

35

Gly Arg Gly Ala Leu Val Asn Ile Ala Ser Thr Ala Ser Phe Gln Pro
50 55 60

40 Thr Pro Gly Met Ala Val Tyr Cys Ala Thr Lys
65 70 75

45 <210> 20

<211> 79

<212> PRT

50 <213> unknown

<220>

55 <221> source

<223> ZF0003535= Actinomyces

<400> 20

Arg Val Asp Val Val Val His Asn Ala Ala Ile Thr Gln Lys Ala Thr

1

5

10

15

5 Phe Arg Asp Ile Thr Pro Ala Asp Phe Glu Arg Ile Leu Arg Val Asn
20 25 30

Leu Thr Gly Val Phe Asn Leu Ser Gln Ala Val Ile Pro Leu Met Ile
35 40 45

10

Gln Arg Gly Gly Ser Ile Val Ser Ile Ser Ser Leu Ser Ala Gln
50 55 60

15

Asn Gly Gly Gly Ile Phe Gly Gly Ala His Tyr Cys Ala Thr Lys
65 70 75

20

<210> 21

<211> 76

25

<212> PRT

<213> unknown

<220>

30

<221> source

<223> ZF0003535= Actinomyces

<400> 21

35

Val Asp Val Val Val Asp Asn Ala Gly Leu Ala Leu Gly Thr Ala Pro
1 5 10 15

40

Ala Pro Gln Val Pro Leu Lys Asp Trp Gln Thr Met Val Asn Thr Asn
20 25 30

45

Ile Thr Gly Leu Leu Asn Ile Thr His His Leu Leu Pro Thr Leu Ile
35 40 45

50

Asp Arg Lys Gly Ile Val Val Asn Leu Ser Ser Val Ala Ala His Tyr
50 55 60

Pro Tyr Thr Gly Gly Asn Val Tyr Cys Ala Ser Lys
65 70 75

55

<210> 22

<211> 72

<212> PRT

<213> unknown

5 <220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

10 <400> 22

Gln	Gly	Ile	Gly	Tyr	Ala	Thr	Ala	Lys	Arg	Leu	Ile	Ser	Leu	Gly	Ala
1				5				10							15

15

Thr	Val	Ala	Ile	Gly	Asp	Ile	Asp	Glu	Ala	Thr	Leu	Ala	Arg	Ala	Ala
			20					25						30	

20

Lys	Asp	Leu	Gly	Ile	Arg	Thr	Phe	Gly	Arg	Leu	Asp	Val	Thr	Asp	Pro
		35					40					45			

25

Ala	Ser	Phe	Phe	Asp	Phe	Leu	Asp	Thr	Val	Glu	Gly	Glu	Leu	Gly	Pro
		50				55				60					

30

Ile	Asp	Val	Leu	Ile	Asn	Asn	Ala								
	65			70											

<210> 23

35 <211> 75

<212> PRT

<213> unknown

40 <220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

45 <400> 23

Gln	Arg	Ile	Gly	Leu	Glu	Ile	Ala	Arg	Thr	Phe	Ile	Lys	Glu	Gly	Ala
1				5				10					15		

50

Thr	Val	Val	Leu	Gly	Asp	Ile	Asn	Glu	Thr	Val	Gly	Thr	Ala	Ala	Val
			20					25				30			

55

Ala	Glu	Leu	Gly	Gly	Glu	Ser	Val	Ala	Arg	Phe	Ala	Ser	Cys	Asp	Val
		35				40					45				

Arg Asp Ser Gly Gln Val Glu Ala Met Leu Asp Leu Ala Glu Ser Ala
50 55 60

5 Phe Gly Pro Val Asp Val Met Met Asn Asn Ala
65 70 75

10 <210> 24

<211> 72

<212> PRT

15 <213> unknown

<220>

20 <221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 24

25 Gln Gly Ile Gly Tyr Gln Thr Ala Lys Glu Leu Ile Arg Arg Gly His
1 5 10 15

Arg Val Ala Ile Gly Asp Ile Asp Glu Ala Arg Ala Lys Glu Thr Ala
20 25 30

30

Ala Glu Leu Gly Val Lys Val Val Thr Arg Leu Asp Val Thr Asp Pro
35 40 45

35

Asp Ser Phe Lys Asp Phe Leu Asp Leu Val Glu Gly Asp Leu Gly Pro
50 55 60

40 Leu Asp Val Leu Ile Asn Asn Ala
65 70

45 <210> 25

<211> 74

<212> PRT

50 <213> unknown

<220>

55 <221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 25

Gly Ile Gly Leu Glu Ile Ala Arg Thr Phe Ile Lys Glu Gly Ala Thr
1 5 10 15

5 Val Val Leu Gly Asp Ile Asn Glu Thr Val Gly Thr Ala Ala Val Ala
20 25 30

10 Glu Leu Gly Gly Glu Ser Val Ala Arg Phe Ala Ser Cys Asp Val Arg
35 40 45

Asp Ser Gly Gln Val Glu Ala Met Leu Asp Leu Ala Glu Ser Ala Phe
50 55 60

15

Gly Pro Val Asp Val Ile Val Asn Asn Ala
65 70

20

<210> 26

25

<211> 74

<212> PRT

<213> unknown

30

<220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

35

<400> 26

Ile Gly Leu Glu Ile Ala Arg Thr Phe Ile Lys Glu Gly Ala Thr Val
1 5 10 15

40

Val Leu Gly Asp Ile Asn Glu Thr Val Gly Thr Ala Ala Val Gly Glu
20 25 30

45

Leu Gly Gly Glu Ser Val Ala Arg Phe Ala Ser Cys Asp Val Arg Asp
35 40 45

50

Ser Gly Gln Val Glu Ala Met Leu Asp Leu Ala Glu Ser Ala Phe Gly
50 55 60

Pro Val Asp Val Met Val Asn Asn Ala Gly
65 70

55

<210> 27

<211> 62

<212> PRT
5
<213> unknown
<220>

<221> source
10 <223> ZF0002333= Rhodococcus erythropolis
<400> 27

Val Pro Val Ala Val Val Asp Leu His Ile Glu Ser Ala Lys Glu Thr
1 5 10 15

15 Val Ala Leu Ile Glu Ser Gln Tyr Gly Thr Pro Ala Leu Ala Leu Glu
20 25 30

20 Ala Asp Val Arg Asp Arg Ala Ala Val Ser Ala Ala Phe Glu Ala Thr
35 40 45

25 Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn Asn Ala
50 55 60

30 <210> 28

<211> 74

<212> PRT
35
<213> unknown

<220>

40 <221> source
<223> ZF0002333= Rhodococcus erythropolis

<400> 28

45 Leu Gly Arg Glu Ile Ala Leu Lys Leu Ala Ser Glu Gly Ala Ser Val
1 5 10 15

50 Val Val Asn Asp Leu Asp Pro Glu Pro Ala Ala Gln Thr Glu Arg Asp
20 25 30

55 Ile Lys Ala Thr Gly Gly Gln Ala Val Ser Cys Val Gly Ser Val Ala
35 40 45

Glu Asp Gly Phe Ala Glu Arg Phe Val Asn Thr Ala Val Glu Ser Phe
50 55 60

Gly Gly Leu Asp Val Met Val Asn Asn Ala
65 70

5 <210> 29
<211> 76
10 <212> PRT
<213> unknown
<220>
15 <221> source
<223> ZF0002333= Rhodococcus erythropolis
<400> 29
20 Ala Gly Leu Gly Val Glu Phe Ala His Arg Phe Ala Ala Arg Gly Ala
1 5 10 15
25 Asn Leu Val Leu Val Ala Arg Arg Ala Asp Arg Leu Glu Ala Leu Ala
20 25 30
30 Thr Glu Leu Arg Val Ala His Gly Ile Thr Val Thr Val Leu Pro Ala
35 35 40 45
Asp Leu Ala Ala Pro Gly Val Gly Ala Thr Leu His Gln Glu Leu Thr
50 55 60
35 Ser Arg Gly Ile Thr Val Thr Ser Leu Ile Asn Asn
65 70 75
40 <210> 30
<211> 72
45 <212> PRT
<213> unknown
<220>
50 <221> source
<223> ZF0003535= Actinomyces
<400> 30
55 Pro Ala Asp Gly Tyr Gln Thr Ala Lys Glu Leu Ile Arg Arg Gly His
1 5 10 15

Arg Val Ala Ile Val Asp Ile Asp Glu Ala Arg Ala Lys Gly Ala Ala
20 25 30

5 Ala Glu Leu Gly Val Lys Val Val Thr Arg Leu Asp Val Thr Glu Pro
35 40 45

10 Asp Ser Phe Thr Thr Phe Leu Asp Leu Val Glu Arg Glu Leu Gly Pro
50 55 60

Leu Asp Ile Leu Val Asn Asn Ala
65 70

15

<210> 31

<211> 67

20

<212> PRT

<213> unknown

25

<220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

30

<400> 31

Ala Thr Asp Gly Ala Arg Val Ala Val Val Asp Leu His Ile Glu Ser
1 5 10 15

35

Ala Glu Glu Thr Val Ala Leu Ile Glu Ser Gln Tyr Gly Thr Pro Ala
20 25 30

40

Leu Ala Leu Glu Ala Asp Val Arg Asp Arg Ala Ala Val Ser Ala Ala
35 40 45

45

Phe Glu Ala Thr Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn
50 55 60

50

Asn Ala Gly
65

<210> 32

<211> 67

55

<212> PRT

<213> unknown

<220>

<221> source
<223> ZF0050310= Arthrobacter paraffineus

5

<400> 32

Ala Ala Asp Gly Ala Arg Val Ala Val Val Asp Leu His Ile Glu Ser
1 5 10 15

10

Ala Lys Glu Thr Val Ala Leu Ile Glu Ser Gln Tyr Gly Thr Pro Ala
20 25 30

15

Leu Ala Leu Glu Ala Asp Val Arg Asp Arg Ala Ala Val Ser Ala Ala
35 40 45
Phe Glu Ala Thr Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn
50 55 60

20

Asn Ala Gly
65

25

<210> 33

<211> 348

30

<212> PRT

<213> unknown

<220>

35

<221> source
<223> ZF0050310= Arthrobacter paraffineus

40

<400> 33
Met Lys Ala Ile Gln Tyr Ala Arg Ile Gly Ala Glu Pro Glu Leu Thr
1 5 10 15

40

45 Glu Ile Pro Lys Pro Glu Pro Gly Pro Gly Glu Val Leu Leu Glu Val
20 25 30

50

Thr Ala Ala Gly Val Cys His Ser Asp Asp Phe Ile Met Ser Leu Pro
35 40 45

55

Glu Glu Gln Tyr Thr Tyr Gly Leu Pro Leu Thr Leu Gly His Glu Gly
50 55 60Ala Gly Arg Val Ala Ala Val Gly Glu Gly Val Glu Gly Leu Asp Ile
65 70 75 80

Gly Thr Asn Val Val Val Tyr Gly Pro Trp Gly Cys Gly Ser Cys Trp
85 90 95

5 His Cys Ser Gln Gly Leu Glu Asn Tyr Cys Ser Arg Ala Lys Glu Leu
100 105 110

10 Gly Ile Asn Pro Pro Gly Leu Gly Ala Pro Gly Ala Leu Ala Glu Phe
115 120 125

15 Met Ile Val Asp Ser Pro Arg His Leu Val Pro Ile Gly Asp Leu Asp
130 135 140

20 Pro Val Lys Thr Val Pro Leu Thr Asp Ala Gly Leu Thr Pro Tyr His
145 150 155 160

Ala Ile Lys Arg Ser Leu Pro Lys Leu Arg Gly Gly Ala Tyr Ala Val
165 170 175

25 Val Ile Gly Thr Gly Leu Gly His Val Ala Ile Gln Leu Leu Arg
180 185 190

30 His Leu Ser Ala Ala Thr Val Ile Ala Leu Asp Val Ser Ala Asp Lys
195 200 205

35 Leu Glu Leu Ala Thr Lys Val Gly Ala His Glu Val Val Leu Ser Asp
210 215 220

40 Lys Asp Ala Ala Glu Asn Val Arg Arg Ile Thr Gly Ser Gln Gly Ala
225 230 235 240

Ala Leu Val Leu Asp Phe Val Gly Tyr Gln Pro Thr Ile Asp Thr Ala
245 250 255

45 Met Ala Val Ala Gly Val Gly Ser Asp Val Thr Ile Val Gly Ile Gly
260 265 270

50 Asp Gly Gln Ala His Ala Lys Val Gly Phe Phe Gln Ser Pro Tyr Glu
275 280 285

55 Ala Ser Val Thr Val Pro Tyr Trp Gly Ala Arg Asn Glu Leu Ile Glu
290 295 300

Leu Ile Asp Leu Ala His Ala Gly Ile Phe Asp Ile Ala Val Glu Thr
305 310 315 320

Phe Ser Leu Asp Asn Gly Ala Glu Ala Tyr Arg Arg Leu Ala Ala Gly
325 330 335

5

Thr Leu Ser Gly Arg Ala Val Val Val Pro Gly Leu
340 345

10 <210> 34

<211> 348

15 <212> PRT

<213> unknown

<220>

20 <221> source

<223> ZF0050310= Arthrobacter paraffineus

<400> 34

25 Met Lys Ala Ile Gln Tyr Thr Arg Ile Gly Ala Glu Pro Glu Leu Thr
1 5 10 15

30 Glu Ile Pro Lys Pro Glu Pro Gly Pro Gly Glu Val Leu Leu Glu Val
20 25 30

35 Thr Ala Ala Gly Val Cys His Ser Asp Asp Phe Ile Met Ser Leu Pro
35 40 45

Glu Glu Gln Tyr Thr Tyr Gly Leu Pro Leu Thr Leu Gly His Glu Gly
50 55 60

40 Ala Gly Arg Val Ala Ala Val Gly Glu Gly Val Glu Gly Leu Asp Ile
65 70 75 80

45 Gly Thr Asn Val Val Val Tyr Gly Pro Trp Gly Cys Gly Ser Cys Trp
85 90 95

50 His Cys Ser Gln Gly Leu Glu Asn Tyr Cys Ser Arg Ala Lys Glu Leu
100 105 110

Gly Ile Asn Pro Pro Gly Leu Gly Ala Pro Gly Ala Leu Ala Glu Phe
115 120 125

5 Met Ile Val Asp Ser Pro Arg His Leu Val Pro Ile Gly Asp Leu Asp
130 135 140

10 Pro Val Lys Thr Val Pro Leu Thr Asp Ala Gly Leu Thr Pro Tyr His
145 150 155 160

Ala Ile Lys Arg Ser Leu Pro Lys Leu Arg Gly Gly Ala Tyr Ala Val
165 170 175

15

Val Ile Gly Thr Gly Leu Gly His Val Ala Ile Gln Leu Leu Arg
180 185 190

20

His Leu Ser Ala Ala Thr Val Ile Ala Leu Asp Val Ser Ala Asp Lys
195 200 205

25

Leu Glu Leu Ala Thr Lys Val Gly Ala His Glu Val Val Leu Ser Asp
210 215 220

30

Lys Asp Ala Ala Glu Asn Val Arg Arg Ile Thr Gly Ser Gln Gly Ala
225 230 235 240

Ala Leu Val Leu Asp Phe Val Gly Tyr Gln Pro Thr Ile Asp Thr Ala
245 250 255

35

Met Ala Val Ala Gly Val Gly Ser Asp Val Thr Ile Val Gly Ile Gly
260 265 270

40

Asp Gly Gln Ala His Ala Lys Val Gly Phe Phe Gln Ser Pro Tyr Glu
275 280 285

45

Ala Ser Val Thr Val Pro Tyr Trp Gly Ala Arg Asn Glu Leu Ile Glu
290 295 300

50

Leu Ile Asp Leu Ala His Ala Gly Ile Phe Asp Ile Ala Val Glu Thr
305 310 315 320

Phe Ser Leu Asp Asn Gly Ala Glu Ala Tyr Arg Arg Leu Ala Ala Gly
325 330 335

55

Thr Leu Ser Gly Arg Ala Val Val Val Pro Gly Leu
340 345

<210> 35
5 <211> 488
<212> DNA
<213> unknown
10 <220>
<221> source
<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
15 ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337=
Methylomonas; ZF0051321= Bacterium; ZF0050782= Lactobacillus
bulgaricus; ZF0050544= Phyllobacterium rubiacearum; ZF0002852=
Rhodococcus; ZF0050310= Arthrobacter paraffineus; ZF0002862=
20 Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0002437= Streptomyces; ZF0003712=
Micromonospora; ZF0003765= Streptomyces; ZF0051305= Bacterium;
ZF0003513= Actinomyces; ZF0050993= Kocuria; ZF0002018=
25 Streptomyces; ZF0003767= Actinomyces; ZF0002332= Streptomyces
diastatochromogenes; ZF0003768= Actinomyces; ZF0002379=
Streptomyces coelescens; ZF0002351= Nonomuraea roseoviolacea;
ZF0003769= Actinomyces;
30 <400> 35
ggccatggg gttgtggcaa ctgttggcac tgctcacaag gactcgagaa ctattgctct
60
cgcgcccaag aactcgaaat caatcctccc ggtctcggtg caccggcgc gttggccgag
120
35 ttcatgatcg tcgattctcc tcgccacctt gtcccgatcg gtgacacctga cccggtaag
180
40 acggtgccgc tgaccgacgc cggtctgacg ccgtatcacg cgatcaagcg ttctctgccg
240
aaacttcgca gaggctcgta cgccgttgc attggtaccg gcgggctcgg ccacgtcgcc
300
45 attcagctcc tccgtcacct ctcggcgtca acggtcatcg ctttggacgt gagcgcggac
360
aagctcgaac tggcaaccaa ggtaggcgct cacgaagtgg ttctgtccga caaggacgcg
420
50 gccgagaacg tccgcaagat cactggaagt caaggcgccg cactggttct cgacttcgtt
480
55 ggctacca
488

<210> 36

<211> 385
<212> DNA
5 <213> unknown
<220>
<221> source
10 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces; ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus; ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylomonas; ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus; ZF0050544= Phyllobacterium rubiacearum; ZF0002852= Rhodococcus; ZF0050310= Arthrobacter paraffineus; ZF0002862= Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces; ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765= Streptomyces; ZF0051305= Bacterium; ZF0003513= Actinomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0002332= Streptomyces diastatochromogenes; ZF0003768= Actinomyces; ZF0002379= Streptomyces coelescens; ZF0002351= Nonomuraea roseoviolacea; ZF0003769= Actinomyces;
25 <400> 36
ggccatggg gttgtggcaa ctgttggcac tgctcacaag gactcgagaa ctattgctct
60
cgcgcccaag aactcggaat caatcctccc ggtctcggtg caccggcgca gttggccgag
30 120
ttcatgatcg tcgattctcc tcgccacctt gtcccgatcg gtgacctcga cccggtaag
180
35 acggtgccgc tgaccgacgc cggtctgacg ccgtatcagc cgatcaagcg ttctctgccg
240
aaacttcgca gaggctcgta cgcggttgtc attggtaaccg gcgggctcgg ccacgtcacc
300
40 attcagctcc tccgtcacct ctcggcggca acggtcatcg ctttggacgt gagcgcggac
360
45 aagctcgaac tggcaaccaa ggttag
385

<210> 37
50 <211> 486
<212> DNA
<213> unknown
55 <220>
<221> source
<223> ZF0050286= Corynebacterium hoagii

<400> 37
ggcccttggg gttgcggacg ttgtggcac tgcgcgagg ggctcgagaa ctactgctcc
60

5 cgcgcaaggg aactcggcat cgccccaccc ggcttggcgcg cgccggcgc gatgccgag
120 tacatgatcg tcgactcgcc gcgtcacctg gtcccgtatcg gtgacacctga ccccgtaacg
180 acggtgccgc tgaccgacgc cgggctcacc ccgtaccacg cgatcaaacg gtcgctcggc
240

15 aagctccgcg ccggctcgta cgcaagtgtatcg atcggcaccg gaggcctcgg acacgtcgcc
300

atccagctgc tccgcccacct gtcccctgca cgcatcatcg ccctcgacgt caacgacgag
360

20 aagctcgct tcgcccgcga ggtcgccgcg cacgagaccg tttgtcgaa cgccgacgccc
420

25 gccgcgaacg tccggaagat cacgggttcg gccgggtccg cgctggtcct agacttcgtc
480

ggctac
486

30 <210> 38

<211> 483

35 <212> DNA

<213> unknown

<220>

40 <221> source
<223> ZF0050310= Arthrobacter paraffineus

<400> 38

45 ggccatggg gctgtggcag ctgttggcac tgctcgcaag gactcgaaaa ctactgttct
60

cggcaaaag aactcggcat caatcctcct ggtctcggtg caccggcgc gttggccgaa
120

50 ttcatgatcg tcgattcacc tcgcccacctc gtcccgtatcg ggcacacctga tccggtaag
180

55 acggtgccac tgaccgacgc cggctgtact ccgtatcaccg cgatcaagcg ttcactgccc
240

aaacttcgctg gttggcgcgtt cggccgtcgta atcggtaccg gcggtctcgg ccatgtcgcc
300

atccaaactcc tccgccacct ctcggcagca accgtcatcg cactcgacgt gagcgcggac
360

aagctcgtac tggcaaccaa ggtaggcgct cacgaagtgg tcctgtccga caaggacgct
5 420

gccgagaacg tccgcaggat caccggaagt cagggcgccg cactggttct tgacttcgtt
480

10 ggc
483

15 <210> 39

<211> 210

<212> DNA

20 <213> unknown

<220>

25 <221> source

<223> ZF0004210= Actinomyces; ZF0004212= Actinomyces; ZF0004211= Actinomyces; ZF0003860= Actinomyces; ZF0004218= Actinomyces; ZF0003868= Actinomadura; ZF0004213= Actinomyces; ZF0003876= Actinomyces; ZF0003866= Actinomyces; ZF0003864= Actinomyces; ZF0003862= Actinomadura; ZF0003869= Actinomyces; ZF0003867= Actinomadura; ZF0004216= Actinomyces; ZF0004235= Actinomyces; ZF0004209= Actinomadura; ZF0004214= Actinomyces; ZF0003871= Actinomyces; ZF0004063= Actinomadura; ZF0004052= Actinomadura; ZF0006405= Streptomyces; ZF0003865= Actinomadura; ZF0004047= Actinomadura; ZF0004070= Actinomyces; ZF0004085= Actinomyces; ZF0004217= Actinomyces; ZF0004089= Actinomadura; ZF0004090= Actinomadura; ZF0006138= Streptomyces; ZF0004236= Actinomadura; ZF0051203= Bacterium;

30

35

40 <400> 39

ggaccgtggg gctgcggcac gtgcgtcaag tgcgccgagg gcaaggagaa ctactgcctg
60

cgcgccaagg aactcggcat cgccccgccc ggactcggct cgcccgccgc catggccgag
120

45 tacatgatcg tcgacgaccc gcgccacctg gtgccgctcg gcggtctcga cccggtccag
180

50 gccgtgccgc tcactgacgc gggcctgaca
210

<210> 40

55 <211> 282

<212> DNA

<213> unknown

<220>

<221> source

5 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
10 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
15 Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
20 Actinomyces; ZF0003535= Actinomyces;

<400> 40

tgtcacaccg atcaccacat cgtcacccggc gcgaccccgaa tgccgtcggtt cccgggtcatg
60

25 ggcgggcacg agggttcggg cgtcatcacc aagctcggcc ctgaggtaa gggactggag
120

30 gtcggcgacc acgtcgttct gtccttcatt ccggcttgcg gaacctgtcc ggcgtgttcg
180

35 gccgggcacg agaatcttg tgcacccggg atgggcctcc tcagcggcca agccatcagc
240

40 gacggcacgt accggatcca ggctcgcggc gaaaacgtga tc
282

<210> 41

40 <211> 276

<212> DNA

45 <213> unknown

<220>

<221> source

50 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
55 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=

Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396= Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces; ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
5 ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538= Actinomyces; ZF0003535= Actinomyces;

<400> 41
10 tgccataccg acgatcatgc tgtgaccggc gatctggcag tcccactccc cgtgatcggt
60 ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgtcgaggta
120
15 ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc
180
240 ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgcaca ggtcgacggg
20 acgtaccgcg cgacagctcg cgggcacgac gtcgga
276
<210> 42
25 <211> 276
<212> DNA
<213> unknown
30 <220>
<221> source
<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
35 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
40 Actinoplanes philippinensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
45 Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

50 <400> 42
tgccatacag acgatcatgc tgtgaccggc gatctggcag tcccactccc cgtgatcggt
60
55 ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgtcgaggta
120
180 ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc

ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgcaca ggtcgacggg
240

5 acgtaccgcg cgacagctcg cgggcacgac gtcgga
276

10 <210> 43

<211> 276

<212> DNA

15 <213> unknown

<220>

<221> source

20 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
25 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
30 Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
35 Actinomyces; ZF0003535= Actinomyces;

<400> 43

tgtcatactg acgatcatgc tgtgaccggt gatctggcag tcccactccc cgtgatcggt
60

40 ggccacgaag gcgcgggcat agtggagaaa gtcggccccg gcgtgcgaga cgtcgaggta
120

45 ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc
180

ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgcaca ggtcgacggg
240

50 acgtaccgcg cgacagctcg cgggcacgac gtcgga
276

55 <210> 44

<211> 276

<212> DNA

<213> unknown

<220>

5 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
10 ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=
15 Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
20 Actinomyces; ZF0003535= Actinomyces;

<400> 44

tgtcacaccg acgatcatgc tgtgaccgggt gatctggcag tcccactccc cgtgatcggt
60

25 ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgtcgaggta
120

30 ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc
180

ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgcacg ggtcgacggg
240

35 acgtaccgcg cgacagctcg cgggcacgac gtcgga
276

<210> 45

40 <211> 276

<212> DNA

45 <213> unknown

<220>

<221> source

50 <223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031=
Streptomyces; ZF0002349= Streptomyces spectabilis; ZF0002434=
Streptomyces; ZF0050993= Kocuria; ZF0002018= Streptomyces;
ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331=
Actinoplanes philippensis; ZF0002441= Streptomyces;
ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis; ZF0003713=
Micromonospora; ZF0004980= Streptomyces; ZF0004821=

Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
 Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
 ZF0006093= Streptomyces; ZF0006103= Streptomyces; ZF0006087=
 Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
 5 ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
 Actinomyces; ZF0003535= Actinomyces;

<400> 45
 10 tgtcacactg acgatcatgc tgtgaccggc gatctggcag tcccaactccc cgtgatcggt
 60 ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgtcgaggta
 120
 15 ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc
 180
 20 ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgcaca ggtcgacggg
 240
 276
 <210> 46
 25 <211> 279
 <212> DNA
 <213> unknown
 30 <220>
 <221> source
 <223> ZF0050310= Arthrobacter paraffineus
 35
 <400> 46
 tgccacacag atctgttac gaagtccgtg ctaccggaaa ggctcggccc ctgcgtgttc
 60
 40 gggcacgaag gagcgggggt ggtcgaggcc gtcggctcgt cgatcgacag cattgcgccc
 120
 ggtgatcacg ttttgctgag ctaccgcagt tgcgggtgt gcaggcagtg cttcagcggt
 180
 45 catcgccgt actgcgaaag ctcacacggg ctcaacagct ctggcgcacg caccgacggc
 240
 50 tcgacgcccgg tccggcgaag cggaaactccg atacggtcc
 279
 <210> 47
 55 <211> 279
 <212> DNA
 <213> unknown

<220>

5 <221> source
 <223> ZF0002333= Rhodococcus erythropolis

10 <400> 47
 tgcatactg atctgttac acggacggtg ctaccggaaa agctcggtttc
 60
 ggacacgaag gcgcggcgt cgtcaagcc gttggctcgt cgatcgacaa catcgccgt
 120

15 ggtgatcacg tattgcttagt ctaccgcagt tgccgttat gcaggcaatg ttcagcgac
 180

20 catcgccgt actgcgaaag ctcacacggg ctcaacagct ctggcgcacg caccgacggc
 240

25 tcgacgcccgg tccggcgaaa cggactccg atacggtcc
 279

30 <210> 48

25 <211> 360

35 <212> DNA

30 <213> unknown

30 <220>

35 <221> source
 <223> ZF0051303= Bacterium; ZF0051337= Methyloimonas; ZF0002862= Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0051305= Bacterium; ZF0003513= Actinomyces; ZF0002351= Nomonuraea roseoviolacea; ZF0003769= Actinomyces; ZF0002017= Streptomyces; ZF0051306= Bacterium; ZF0002016= Streptomyces; ZF0003504= Actinomyces; ZF0006073= Streptomyces; ZF0003770= Actinomyces; ZF0002352= Actinoplanes italicus; ZF0002378= Streptomyces aureomonopodiales; ZF0006089= Streptomyces; ZF0006106= Streptomyces; ZF0051325= Bacterium; ZF0006108= Streptomyces; ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532= Actinomyces; ZF0003548= Nocardiaform;

45 <400> 48
 tgcgggacgg accgcgagat cgcctcggtt atctacgggt gggcgccgcc gggacgcgaa
 60

50 cacctcggtcc tcgggcacga atcgctgggc cgagtacgca cggcgccccga cggcagcggt
 120

55 ttcggccggcgt gtatctcggt cgtcggttgc gtgcgcaggc ccgatccggc ggcgtgcggg
 180

55 gcgtgtgcgc acggtgagtt cgacatgtgc cgcaacgggt agtacgtcga ggcgggatc
 240

aagcagatcg acgggtacgg gtcgacgtcg tgggtggtgg acgcccacta cacggtaag
300

ctggaccgg cgctcacca ggtgggtgtg ctgatggaac cgacgacggt gcttggccaa
5 360

<210> 49

10 <211> 421

<212> DNA

15 <213> unknown

15 <220>

<221> source

20 <223> ZF0051303= Bacterium; ZF0051337= Methyloimonas; ZF0002862= Streptomyces clavuligerus; ZF0050292= Bacterium; ZF0051305= Bacterium; ZF0003513= Actinomyces; ZF0002351= Nomonuraea roseoviolacea; ZF0003769= Actinomyces; ZF0002017= Streptomyces; ZF0051306= Bacterium; ZF0002016= Streptomyces; ZF0003504= Actinomyces; ZF0006073= Streptomyces; ZF0003770= Actinomyces; ZF0002352= Actinoplanes italicus; ZF0002378= Streptomyces aureomonopodiales; ZF0006089= Streptomyces; ZF0006106= Streptomyces; ZF0051325= Bacterium; ZF0006108= Streptomyces; ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532= Actinomyces; ZF0003548= Nocardiaform;

30

<400> 49

tgtggtaccg acctgcacat ccggtcctgg gacggatggg cgcagaagac catgccacc
60

35

ccgctcacgc tcggccacga gttcgtcggc gaggtcgtcg agaccggccg cgacgtgacc
120

gacatccagg tcggcgacct ggtcagcggc gagggccacc tggtctgcgg caagtgcgc
180

40

aactgcctgg ccggccgccc tcacctgtgc cgccgcgaccg tcggcctcgg tgtcggccgt
240

45

gacggcgccct tcgcccagta cgtggtgctg cccgcctcca acgtgtgggt gcaccgggtg
300

ccggtcgacc tcgacgtcgc cgcgatcttc gacccgttcg gcaacgcggt gcacaccgcg
360

50

ctctccttcc cgctcgtcgg cgaggacgtg ctggtcacccg gtgccggtagtac catcgccatc
420

t
421

55

<210> 50

<211> 414

5 <212> DNA
 <213> unknown
<220>
10 <221> source
 <223> ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
 ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310=
 Arthrobacter paraffineus; ZF0002437= Streptomyces; ZF0003712=
 Micromonospora; ZF0003765= Streptomyces; ZF0002332=
 Streptomyces diatsatochromogenes; ZF0003768= Actinomyces;
 ZF0002379= Streptomyces coelescens; ZF0002443= Streptomyces;
15 ZF0002442= Streptomyces; ZF0002436= Streptomyces; ZF0050994=
 Bacterium; ZF0050992= Bacterium; ZF0050442= Bacterium;
 ZF0002049= Streptomyces; ZF0006069= Streptomyces; ZF0006075=
 Streptomyces; ZF0004724= Nocardiaform; ZF0002392= Actinoplanes
 nipponensis; ZF0002356= Actinoplanes brasiliensis; ZF0003501=
20 Actinomyces; ZF0051322= Bacterium; ZF0006078= Streptomyces;
 ZF0006092= Streptomyces; ZF0006090= Streptomyces; ZF0006084=
 Streptomyces; ZF0006068= Streptomyces; ZF0050284= Rhodococcus;
 ZF0050028= Agrobacterium tumefaciens; ZF0003540= Actinomyces;
25 ZF0003528= Actinomyces; ZF0003529= Actinomyces;
 <400> 50
 ggcctgacga tcggccatga accgggtgggc gtcatcgaaa agctgggcag cgccgtgacg
 60
30 ggttaccgcg agggccaacg cgtgatcgcc ggcgcgatct gccccaaactt caattcgtat
 120
 gccgcgcagg atggcgcgcc gtcgcaggat ggcagctacc tggtgccag cggcgcatgc
 180
35 ggctgccatg gataccgggc cacggccggc tggcgctttg gcaacatcat ccatggcgcc
 240
 caggcccgaat acctgctggc tcccgatgcg cagggcaatc tggcgccggc tccggacaac
40 300
 ctgagcgatg aacaggtgct gatgtgccc gacatcatgt ccaccggctt caaaggcgca
 360
45 gagaacgcac acatccgcac cggcgacacg gtggcggtat ttgcgcagg acca
 414
 <210> 51
50 <211> 432
 <212> DNA
55 <213> unknown
 <220>
 <221> source

<223> ZF0050197= *Pseudomonas oleovorans*; ZF0050294= *Rhodococcus*;
 ZF0050330= *Bacillus*, ZF0002852= *Rhodococcus*; ZF0050310=
Arthrobacter paraffineus; ZF0002437= *Streptomyces*; ZF0003712=
Micromonospora; ZF0003765= *Streptomyces*; ZF0002332=
 5 *Streptomyces diatsatochromogenes*; ZF0003768= *Actinomyces*;
 ZF0002379= *Streptomyces coelescens*; ZF0002443= *Streptomyces*;
 ZF0002442= *Streptomyces*; ZF0002436= *Streptomyces*; ZF0050994=
Bacterium; ZF0050992= *Bacterium*; ZF0050442= *Bacterium*;
 10 ZF0002049= *Streptomyces*; ZF0006069= *Streptomyces*; ZF0006075=
Streptomyces; ZF0004724= *Nocardiaform*; ZF0002392= *Actinoplanes*
 nippensis; ZF0002356= *Actinoplanes brasiliensis*; ZF0003501=
Actinomyces; ZF0051322= *Bacterium*; ZF0006078= *Streptomyces*;
 15 ZF0006092= *Streptomyces*; ZF0006090= *Streptomyces*; ZF0006084=
Streptomyces; ZF0006068= *Streptomyces*; ZF0050284= *Rhodococcus*;
 ZF0050028= *Agrobacterium tumefaciens*; ZF0003540= *Actinomyces*;
 ZF0003528= *Actinomyces*; ZF0003529= *Actinomyces*;

<400> 51
 tgcgggacgg acctgcacat cctcggaggt gacgtccccg aggtgaccga cgggcgaatc
 20 60
 ctgggccacg aggccgtcgg gaccgtggtc gaggtggcg acggcgtaca gacactcgcg
 120
 25 ccgggcgatc gcgtgctcg tctcggtgtc accgcattgcg gtacgtgccg gttctgccgc
 180
 gagagccgct acggcaatg cctcggaggc ggccggcttggaa tcctcggaca cctgatcgac
 240
 30 ggcacccagg ccgaactcgt ccgagttccg tacgcccaca attcgaccac ccgcattcccc
 300
 35 gacggtgtga gcgacgagca gatgctcatg ctcgcccaca tcctgcccac ctcctacgag
 360
 gtcgggtttc tcaacggctg tctccggccg gccggacgtcg tcgtcatcat cggggccgac
 420
 40 gatcgccctc tt
 432

45 <210> 52
 <211> 220
 <212> DNA

50 <213> unknown
 <220>

55 <221> source
 <223> ZF0050310= *Arthrobacter paraffineus*

<400> 52
 cgtcgacgta gtcgtcgaca acgcgggatt cggAACACAC ggggcattcg tggacgaaga
 60

tcacgagcgc gtcacgtccg agattcagct caacatcgcc acgctggtcg agctgacaca
120

5 cacattcccg cccgacacctc tcaccggccg cgaggactg gtcaacatcg ccagcacagc
180

gtcggtccag ccgacaccgg gcatggccgt ctactgcgct
220

10 <210> 53

<211> 226

15 <212> DNA

<213> unknown

20 <220>

<221> source

<223> ZF0050310= Arthrobacter paraffineus

25 <400> 53

cgtcgacgtc gtcgtccaca acgccggatt cgaaacacac gggcattcg tggacgaaga
60

tctcgagcgc gtcacgtccg agattcagct caacatcgcc acgctggtcg agctgacaca
30 120

cacattcctg cccgacacctc tcaccggccg cgaggactg gtcaacatcg ccagcacagc
180

35 gtcgttccag ccgacaccgg gcatggccgt ctactgcgccc accaag
226

40 <210> 54

<211> 237

<212> DNA

45 <213> unknown

<220>

<221> source

50 <223> ZF0003535= Actinomyces

<400> 54

cgtgtcgacg tcgtggtgca caatgctgct atcactcaaa aggccacttt tcgcgacatt
60

55 accccccggccg attttgagcg catcctgcgg gtgaacctga ccggcgtctt caacctgagc
120

caagccgtca ttcccttgat gattcagcgc ggcggaggaa gcacgtctc gatttcctcg
180

ctgtcggcgc agaacggcgg gggatcttc ggcggcgcacc actattgcgc aaccaag
5 237

<210> 55

10 <211> 229

<212> DNA

<213> unknown
15 <220>

<221> source
<223> ZF0003535= Actinomyces
20 <400> 55
cgtcgacgtc gtcgtcgaca acgccggtct ggcactggc acggcccccg cggcgcaggt
60

25 gcccgtaaag gactggcaga ccatggtgaa caccaacatc accggtctac tgaacatcac
120

ccaccatctc ctgccgacac tgatcgaccg taaaggtatc gtcgtcaacc tttcgctgt
180

30 tgccgcgcac tatccctata cggcggcaa tgtatactgc gcctccaag
229

35 <210> 56

<211> 216

<212> DNA
40 <213> unknown

<220>

45 <221> source
<223> ZF0050310= Arthrobacter paraffineus

<400> 56
caggggatcg gatacgccac cgcgaaagcgg ctgatcagcc tgggtgcgac ggtcgcgatc
50 60

ggcgacatcg acgaagccac tctcgcgca gcagccaagg atttggcat ccgcacgttc
120

55 gggcgccctcg acgtcaccga ccccgccctcg ttcttcgact tcctcgacac cgtcgaaggt
180

gaactcggcc cgatcgacgt gctgatcaac aacgcg
216

<210> 57
5 <211> 225
<212> DNA
<213> unknown
10 <220>
<221> source
<223> ZF0080310= Arthrobacter paraffineus
15 <400> 57
cagcgatcg ggctcgaaat tgcgcgcacc ttcatcaagg aaggcgac cgtcgatctc
60
20 ggcgacatca acgaaaccgt gggAACGGCT gcggTCGCCG aactcggtgg agagtcggc
120
gcccgttgc cttcctgcga cgtgcgtgac tccggacagg tcgaggccat gctcgatctg
180
25 gccgaaagcg ctccggtcc agtcgatgtc atgatgaaca acgac
225

<210> 58
30 <211> 216
<212> DNA
35 <213> unknown
<220>
<221> source
40 <223> ZF0080310= Arthrobacter paraffineus
<400> 58
cagggatcg gctaccagac cgcaaggag ctgatccgac gaggtcaccc cgtggccatc
60
45 ggcgacatcg acgaggcacg tgctaaggag accgccccg aactgggggt taaggttgtc
120
50 acccgctcg atgtcaccga ccctgactcg ttcaaagact ttctcgacct agtcgaggga
180
gacctcgcc ccctcgacgt gctgatcaac aacgac
216
55 <210> 59
<211> 222

<212> DNA
<213> unknown
5 <220>
<221> source
<223> ZF0080310= Arthrobacter paraffineus
10 <400> 59
gggatcgggc tcgaaattgc gcgcaccctc atcaaggaag gcgcgaccgt cgttctcgcc
60
15 gacatcaacg aaaccgtggg aacggctgctg gtcgcccgaac tcggtgagaga gtcggctcgcc
120
cgttgcgtt cctgcgacgt gcgtgactcc ggacaggtcg aggccatgct cgatctggcc
180
20 gaaagcgctt tcggtccagt cgatgtcatc gtgaacaacg cg
222
<210> 60
25 <211> 222
<212> DNA
<213> unknown
30 <220>
<221> source
<223> ZF0080310= Arthrobacter paraffineus
35 <400> 60
atcgggctcg aaattgcgcg cacccttcatc aaggaaggcg cgaccgtcg tctcgccgac
60
40 atcaacgaaa ccgtggAAC ggctgcggc ggcgaactcg gtggagagtc ggtcgccccgt
120
ttcgcttcct gcgacgtcg tgactccgga caggtcgagg ccatgctcga tctggccgaa
180
45 agcgcttcg gtccagtcga tgtcatggc aacaacgccc gc
222
50 <210> 61
<211> 186
<212> DNA
55 <213> unknown
<220>
<221> source

<223> ZF0002333= Rhodococcus erythropolis

<400> 61
5 gtgccggtcg cggtcggtga cttcacatc gaaagtgcac agtagaccgt cgcaacttac
60

gaatcgcagt acggcacacc cgcgctcgcc cttgaggccg atgtgcgcga ccgcggcc
120

10 gtgagcgccg ctttcgaagc caccgtcgcc gaatggggac gcttcgacta cctcgtaac
180

aacgcc
186
15

<210> 62

<211> 222
20
<212> DNA
<213> unknown

<220>
25
<221> source
<223> ZF0002333= Rhodococcus erythropolis .

<400> 62
30 ctccggccgtg aaatcgctt caagctcgct tccgaaggcg cctcggttgtt ggtcaacgac
60

ctcgatcccc aacctgccc tcagaccgag cgcgatata aagccacagg tggacaggct
120
35 gtctcggtcg tcggctccgt tgccgaggac gggttcgccc aacgcttcgtt gaacactgcc
180

gtcgaatcat tcggcggact cgacgtcatg gtgaacaacg cg
40 222

<210> 63

45 <211> 231

<212> DNA

<213> unknown
50
<220>

<221> source
<223> ZF0002333= Rhodococcus erythropolis
55
<400> 63
60 gcggggctcg gagtgaaatt cgctcaccgc ttccggctc gcggtgcaaa tctggttctc

gtcggccaggc gggcagatcg cctcgaagcc ctgcgttaccg aactccgcgt cgcccacggc
120

atcacagtca cagttctgcc tgccgacctg gcggcgccccg gcgtcgccgc aacactgcac
5 180

caggagctga caagccgtgg catcaccgtc acctcgctga tcaacaacgc c
231

10 <210> 64

<211> 216

15 <212> DNA

<213> unknown

<220>

20 <221> source
<223> ZF0003535= Actinomyces

<400> 64

25 ccagcgacg gctatcagac agcgaaggag ttgattcgac gaggccaccg ggtcgccatc
60

gtcgacatcg acgaggcacg tgcgaagggg gccgcccgcg aactcggggt gaaggtcgtc
120

30 acccgactcg acgtcaccga acctgactcg ttcacaacgt ttctggacct ggtcgaacgt
180

gaactcggac ccctcgacat cctggtcaac aacgac
35 216

<210> 65

40 <211> 201

<212> DNA

<213> unknown

45 <220>

<221> source
<223> ZF0050310= Arthrobacter paraffineus

50 <400> 65

gccacggacg gtgccccgcgt cgcggtcgac gaccttcaca tcgaaaagtgc agaggagacc
60

55 gtcgcactta tcgaatcgca gtacggcaca cccgcgtcg cccttgaggc cgatgtgcgc
120

gaccgcgcgcg ccgtgagcgc cgcttcgaa gccaccgtcg ccgaatgggg acgcttcgac
180

tacctcgta acaacgcccc c
201

5 <210> 66
 <211> 201

10 <212> DNA
 <213> unknown

 <220>

15 <221> source
 <223> ZF0050310= *Arthrobacter paraffineus*

 <400> 66
gcccggacg gtgccccgt cgccgtcgt gaccttcaca tcgaaagtgc aaaggagacc
20 60

 gtcgactta tcgaatcgca gtacggcaca cccgcgctcg cccttgaggc cgatgtgcgc
120

25 gaccgcgccg ccgtgagcgc cgcttcgaa gccaccgtcg ccgaatgggg acgcttcgac
180

 tacctcgta acaacgcccc c
201

30 <210> 67

 <211> 1047

35 <212> DNA
 <213> unknown

40 <220>

 <221> source
 <223> ZF0050310= *Arthrobacter paraffineus*

45 <400> 67
atgaaggcaa tccagtacgc gagaatcggc gcagaacccg aactcacgga gattccaaa
60

 cccgagcccg gtccaggtga agtgctcctg gaagtcacccg ctgccggcgt ctgccactcg
50 120

 gacgacttca tcatgaggct gcccgaagag cagtacacct acggccttcc ttcacgctc
180

55 ggccacgaag gcgccggccg ggtcggccg gtcggcgagg gcgtcgaagg actcgacatc
240

 ggaaccaatg tcgtcggtcta cggaccctgg ggctgtggca gctgtggca ctgctcgcaa
300

ggactcgaaa actactgttc tcgggcaaaa gaactcggca tcaatcctcc tggtctcggt
360

gcacccggcg cgttggccga attcatgatc gtcgattcac ctcgccacct cgtcccgatc
5 420

ggcgacctcg atccggtcaa gacggtgcca ctgaccgacg ccggtctgac tccgtatcac
480

10 gcgatcaagc gttcactgcc gaaacttcgc ggtggcgcgt acgccgtcgt catcggtacc
540

ggcggtctcg gccatgtcgc catccaactc ctccgccacc tctcggcagc aaccgtcatc
600

15 gcactcgacg tgagcgcgga caagctcgaa ctggcaacca aggtaggcgc tcacgaagtg
660

gtcctgtccg acaaggacgc ggccgagaac gtccgcagga tcaccggaag tcagggcgcc
20 720

gcactggttc tcgacttcgt cggctatcag cccaccatcg acaccgcgt ggctgtcgcc
780

ggcgtcggat cggacgtcac gatcgtcggt atcggcgcac ggcaggccca tgccaaagtc
25 840

gggttcttcc aaagtcccta cgaggcttct gtgacagttc cgtactgggg tgcccgcaac
900

30 gagctgatcg aattgatcga cctggcgcac gccggcatct tcgacatcgc ggtggagacc
960

ttcagtctcg acaacggcgc cgaagcgtat cgacgactgg ccgcccggAAC gctcagcggc
1020

35 cgcgcggttg tggccctgg tctgttag
1047

40 <210> 68

<211> 1047

<212> DNA

45 <213> unknown

<220>

50 <221> source
<223> ZF0050310= Arthrobacter paraffineus

<400> 68
atgaaggcaa tccagtacac gagaatcggc gcagaacccg aactcacgga gattccaaa
55 60

cccgagcccg gtccaggtga agtgctcctg gaagtcacccg ctgcccggcgt ctgccactcg
120

gacgacttca tcatgagcct gcccgaagag cagtacacct acggcttcc tctcacgctc
180
5 ggccacgaag gcgcggccg ggtcgccgcc gtcggcgagg gcgtcgaagg actcgacatc
240
ggaaccaatg tcgtcgctca cggaccctgg ggctgtggca gctgttggca ctgctcgcaa
300
10 ggactcgaaa actactgttc tcgggcaaaa gaactcggca tcaatcctcc tggtctcggt
360
15 gcacccggcg cggtggccga attcatgatc gtcgattcac ctcgccacct cgtcccgatc
420
ggcgcacctcg atccggtcaa gacggtgcca ctgaccgacg ccggtctgac tccgtatcac
480
20 gcgatcaagc gttcactgcc gaaacttcgc ggtggcggt acgcccgtcg catcggtacc
540
ggcggtctcg gccatgtcgc catccaactc ctccgccacc tctcggcagc aaccgtcatc
600
25 gcactcgacg tgagcgcgga caagctcgaa ctggcaacca aggtaggcgc tcacgaagtg
660
gtcctgtccg acaaggacgc ggccgagaac gtccgcagga tcaccggaag tcagggcgcc
720
30 gcactggttc tcgacttcgt cggctatcag cccaccatcg acaccgcgat ggctgtcgcc
780
ggcgctggat cggacgtcac gatcgctggg atcggcgacg ggcaggccca tgccaaagtc
840
35 gggttttcc aaagtctta cgaggcttct gtgacagttc cgtactgggg tgcccgcaac
900
40 gagctgatcg aattgatcga cctggcgac gccggcatct tcgacatcgc ggtggagacc
960
ttcagtctcg acaacggcgc cgaagcgtat cgacgactgg ccgcccggaaac gtcagcggc
1020
45 cgcgcggttg tggtccctgg tctgttag